

**REMARKS**

Claims 1-8 were pending in the application. Claims 1, and 3-7 have been amended. Claims 2 and 8 have been canceled without prejudice or disclaimer. Claims 9-16 have been added. No new matter has been introduced. Thus, claims 1, 3-7, and 9-16 are submitted for reconsideration at this time.

**In the Abstract**

The Abstract is objected to as being more than one paragraph in length. Applicants have provided a new Abstract as indicated on the attached Appendix. Withdrawal of the objection to the abstract is earnestly solicited.

**Rejections Under 35 U.S.C. §112, ¶2**

Claims 7 and 8 stand rejected under 35 U.S.C. §112, ¶2 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, claims 7 and 8 are rejected as being unclear what is meant by a "large" number of bundles. Applicants have amended claim 7 accordingly, and have canceled claim 8 without prejudice or disclaimer. Withdrawal of the rejection under 35 U.S.C. §112, ¶2 is earnestly solicited.

**Rejections Under 35 U.S.C. §102(b)**

Claims 1-3, 6, and 8 stand rejected under 35 U.S.C. §102(b) as being anticipated by Japanese Reference JP 08-197,626 A (JP '626 hereafter). Claims 1, 5 and 7 stand rejected under 35 U.S.C. §102(b) as being anticipated by Japanese Reference 35748/1985 ("JP '748" hereafter). Applicants respectfully traverse these rejections for at least the following reasons.

The presently claimed invention is directed at a nonwoven fabric having at least three reinforcing fiber bundle layers with the directions of the reinforcing fiber bundles in respective layers differing between the adjacent layers. By way of example, one such nonwoven fabric is described on page 11, line 3 to page 12, line 6 of the present specification, and includes the following three layer (1)-(3) structure:

- (1) Unidirectional reinforcing fiber bundle layer in a warp direction;
- (2) Unidirectional reinforcing fiber bundle layer in an oblique direction; and
- (3) Unidirectional reinforcing fiber bundle layer in a weft direction.

The aforementioned nonwoven fabric of the present invention is superior to woven fabrics due to the particular alignment of the fiber bundle layers. Additionally, by eliminating weaving of the respective layers, the aforementioned nonwoven fabric

exhibits superior reinforcing properties, has improved flexibility, and is thus a superior material for use in applications such as making molded articles of complicated shapes (see page 7, lines 9-25 of the present specification). JP '626 and JP '748 fail to disclose or suggest such a structure.

**JP '626**

JP '626 fails to disclose or suggest a nonwoven fabric with the directions of at least three reinforcing fiber bundles in respective layers differing between the adjacent layers. Rather, as shown in FIGs. 2-4, JP '626 discloses setting two or more fiber bundles arranged in parallel at equal intervals to form a sheet (see paragraphs [0022] and [0051]). Additionally, a glass cloth (i.e., one type of woven fabric) is added at an angle to the fiber bundle sheets (see paragraph [0060]). Thus, JP '626 discloses a three layer woven fabric having the following three layer (1)-(3) structure:

- (1) Unidirectional reinforcing fiber bundle layer in a warp direction;
- (2) Glass Cloth (woven fabric) layer in a warp and weft direction; and
- (3) Unidirectional reinforcing fiber bundle layer in a warp direction.

The aforementioned structure of JP '626 is not, however, a *nonwoven* fabric having at least three reinforcing fiber bundle layers with the directions of the reinforcing fiber bundles in respective layers differing between the adjacent layers.

Applicants further note that woven fabric structures such as JP '626 tend to have high directional strength but reduced flexibility due to the alternating intersecting "above and below" configuration as described on page 4, lines 8-14 of the present specification, and are thus not suitable for molded articles having a complicated shape. Rather, woven fabric structures such as JP '626 are directed at applications using flat plate structures, such as printed wiring boards.

As JP '626 fails to disclose or suggest all of the claimed limitations, it cannot anticipate the claimed invention. Withdrawal of the rejection under §102(b) over JP '626 is earnestly solicited.

**JP '748**

JP '748 fails to disclose or suggest a nonwoven fabric with the directions of at least three reinforcing fiber bundles in respective layers differing between the adjacent layers. Rather, JP '748 discloses a nonwoven fabric consisting of two reinforcing fiber layers. Additionally, an extremely thin nonwoven thermoplastic fiber (i.e., *not* reinforcing fibers) sticking fabric is used to stick the two fiber layers together. Thus,

JP '748 discloses a two reinforcing fiber layer material having the following three component (1)-(3) structure:

- (1) Unidirectional reinforcing fiber bundle layer in a warp direction;
- (2) Thermoplastic fiber sticking fabric; and
- (3) Unidirectional reinforcing fiber bundle layer in a weft direction.

JP '748 discloses that by providing the extremely thin fiber sticking fabric, linearity of the warps and the wefts are maintained, and both of the bundles of the warps and those of the wefts become flat. Furthermore, the base fabric of JP '748 allegedly has reduced peeling between the layers of the composite material.

JP '748 fails to disclose or suggest, however, a nonwoven fabric with the directions of at least three reinforcing fiber bundles in respective layers differing between the adjacent layers, and thus cannot anticipate the claimed invention. Withdrawal of the rejection under §102(b) over JP '748 is earnestly solicited.

**Rejections Under 35 U.S.C. §103(a)**

Claim 4 stands rejected under 35 U.S.C. §103(a) as being unpatentable over JP '626. Claim 4 is dependent upon claim 1, and is considered allowable for at least the aforementioned reasons with respect to claim 1, in addition to any further patentable features recited therein. Allowance of claim 4 is earnestly solicited.

**New Claims 9-16**

New claims 9-16 have been added to more fully recite features of the present invention. Support for new claims 9-16 can be found, for example, in original claims 1-8. New claims 9-16 are considered allowable for similar reasons as those set forth above with respect to claim 1, in addition to any further patentable features recited therein. Allowance of claims 9-16 is earnestly solicited.

**Conclusion**

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

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Date

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Should additional fees be necessary in connection with the filing of this paper, or if a petition for extension of time is required for timely acceptance of same, the Commissioner is hereby authorized to charge deposit account No. 19-0741 for any such fees; and applicant hereby petitions for any needed extension of time.

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

1. (Amended) A [reinforcing fibrous substrate for composite materials] nonwoven fabric which has at least [two] three fiber bundle layers comprising:

unidirectional reinforcing fiber bundles, [characterized in that] wherein the directions of the reinforcing fiber bundles in the respective fiber bundle layers differ between the adjacent layers[,]; and

a thermoplastic resin component that is randomly and partially adhered to the surface of the reinforcing fiber bundles in at least one fiber bundle layer [and], wherein the fiber bundle layers are bonded to each other with the thermoplastic resin component.

3. (Amended) The [reinforcing fibrous substrate for composite materials] nonwoven fabric according to claim 1 which is a triaxial nonwoven fabric.

4. (Amended) The [reinforcing fibrous substrate for composite materials] nonwoven fabric according to claim 1 which is a tetraxial nonwoven fabric.

5. (Amended) The [reinforcing fibrous substrate for composite materials] nonwoven fabric according to claim 1, wherein the thermoplastic resin component is a thermoplastic resin fiber.

6. (Amended) The [reinforcing fibrous substrate for composite materials] nonwoven fabric according to claim 1, wherein the thermoplastic resin component is a thermoplastic resin.

7. (Amended) A method for producing a [reinforcing fibrous substrate for composite materials] nonwoven fabric which has at least three fiber bundle layers comprising unidirectional reinforcing fiber bundles, [characterized by] the method comprised of:

arranging reinforcing fiber bundles and thermoplastic resin fibers together in one direction[,];

placing [a large number of] the resulting bundles in parallel to form a fiber bundle layer of unidirectional reinforcing fiber bundles[,];

stacking the fiber bundle layer with a fiber bundle layer of reinforcing fiber bundles so that the layers are different in directions of the bundles from each other[,];  
and

heating and pressing the fiber bundle layers stacked in layers to bond the fiber bundle layers to each other.

## APPENDIX

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41 A nonwoven fabric is provided which has at least three fiber bundle layers. The nonwoven fabric includes unidirectional reinforcing fiber bundles, wherein the directions of the reinforcing fiber bundles in the respective fiber bundle layers differ between the adjacent layers. A thermoplastic resin component is randomly and partially adhered to the surface of the reinforcing fiber bundles in at least one fiber bundle layer and the fiber bundle layers are bonded to each other with the thermoplastic resin component.

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